EVALUATING INDIVIDUAL HOMES FOR RISK

On a macro scale, areas of high risk have been identified by the fires agencies and verified using GIS technology. However, there are homes throughout the county that are at high risk due to adjacent forest fuels, slope, aspect and other factors that were not identified by these approaches. In Boundary County, a methodology was developed by Inland Forest Management to assess the risk to individual homes from wildfire. The method uses a matrix of factors affecting fire behavior to evaluate the risk. This "Risk Matrix" was also used to evaluate homes throughout Bonner County. The "Risk Matrix" is described, and its use explained, in the following section.

The "Risk Matrix"
The following attributes are used in the "Risk Matrix":

Aspect – Aspect affects fire behavior because of its influence on fuels. Some aspects are warmer than others, and are typically warmer and dryer for longer time periods in a given day or season. Certain aspects are directly exposed to the drying effects of sunshine, or prevailing winds, while others are only indirectly exposed to sunlight or prevailing winds. The drier aspects include southerly to westerly exposures. Conversely, the wetter aspects include northerly to easterly exposures.

Slope – Slope is a key factor because it generally increases the effects of wind on fire behavior. Fire usually moves uphill, and the steeper the slope, the greater the thermal effects of the fire, the hotter the fire and the longer the flame lengths, thus the higher the risk.

Wind Exposure – Exposure was chosen because wind often has the greatest effect on how a given fire burns. The more wind that can reach the base of the flames of a fire, the hotter the fire and longer the flame lengths. Standard estimates used by fire behavior specialists for correlating wind exposure with flame length were used to evaluate each situation. Wind exposure is a combination of topography position and the height and density of vegetation on the windward side.

Fuel Model – The depth and arrangement of the fuel bed, as expressed by Fuel Model, has a tremendous effect on expected fire behavior. We used the standard 13 fuel models to predict fire behavior. Each fuel model will yield a different flame length under standard weather/fuel conditions. Flame length is a good estimator of the expected intensity of a fire, and can be used to predict the effects a given fire will have on the area being burned. Fuel models were ranked low to high based on the flame length that is produced under standard conditions. Short flame lengths yield low risk, long flame lengths yield high risk. (Refer to Appendix E)

Ladder – The capability of fuels to act as a ladder, carrying fire from ground fuels up into the crowns of standing timber was chosen as a factor because the most dangerous fire is a crown fire. The closer ladder fuels are to ground fuels and the more continuous they are into the crowns, the higher the risk to nearby property.

Building Exposure – Nearness of wildland fuels to a building is an important factor. The closer these fuels are to the building, the more likely that fire burning in the fuels can spread to the building. Fires can spread to the building either by direct exposure to flames, by continued exposure to the radiant heat, or by exposure to a wave of sparks given off by the fire. The closer the burning vegetation is to a building, the higher the probability that the building will catch fire.

For each of these six factors, three ranges of conditions were established to show low, moderate, or high risk when fire occurs within one of these ranges. The ranges for each factor are shown in figure 1

Figure 1

Field Risk Assessment Form

Factor	Low	Moderate	High
Aspect	N, NE	NW, E, SE	Flat, W, SW, S
Slope	< 20%	20% - 40%	> 40%
Wind Exposure	Full Shelter	Partial Shelter	Exposed
Fuel Model	8, 9	1, 5, 11	2, 3, 6, 10, 12, 13
Ladder Fuels	.> 30’	10’ – 30’	< 10’
Building Exposure	> 50’	25’ – 50’	< 25’
Totals	L_____	M_____	H_____

On the field form, each existing condition at each viewed property was circled for each factor. This documented the field assessment for that home. The total numbers of low, moderate, and high risk factors were then noted at the bottom of the form. Only homes that could be seen from public roads were evaluated.

Roads around the county were randomly selected for inclusion in the sample. For example, Upper Pack River Road, Rapid Lightning Creek Road, East Spring Creek

Road, Cavanaugh Bay Road, Hoo Doo Loop Road, and Blacktail/Little Blacktail Road are some of the locations where homes were evaluated for risk. Every third home along a selected road was evaluated. As a result of this sampling scheme, 393 homes were evaluated for risk.

This sampling technique has some limitations, but it was felt that the process would yield valuable information about the risk to individual homes outside of those areas identified as high risk by the local fire districts and through the use of GIS. Limitations of the sampling technique include: only homes visible from public roads were evaluated; often only one limited view of the property was available; estimates of the closeness of vegetation to the buildings were sometimes difficult to make accurately**.** Some of these limitations are compensating from one property to another, with one being higher risk than evaluated and another being lower. Since fuel mitigation work would occur after a complete risk assessment was completed by the BONFIRE program, these limitations would not affect the ability for a landowner to have work done to create defensible/survivable space for a building.

Results of Field Assessment

During the field assessment it became obvious that three factors were most influential in evaluating a particular property's exposure to risk from fire, namely fuel model, proximity of fuels to the building and ladder fuels. Those factors were all related to forest fuels and their relationship to the building observed. The fuel model that is around a building is perhaps most important, especially if the distances between the forest fuels and the building is small. Low and dense ladder fuels that are also close to the building greatly increase the probability that the building will not survive a nearby fire. The other factors such as aspect, slope, and wind exposure, although important, do not seem to carry the same weight in evaluating risk as do the factors that involve the fuels.

To establish a property's relative risk in the event of a nearby forest fire, the following criteria were used for the designation of High Risk:

> **A fuel model that is moderate or high risk with ladder fuels less than 10 feet and with a building exposure of less than 25 feet.**
> **OR**
> **A fuel model that is high risk, with ladder fuels less than 10 feet, with a building exposure of 25 – 50 feet and at least one other risk factor in the high category.**

These criteria were used to refine the overall hazard rating recorded for each building evaluated. As previously stated, total of 393 buildings were evaluated using this procedure (See Appendix F for sample data). Of the buildings sampled, 47% are rated at High Risk, with 30% rated at Moderate Risk, and 23% rated at Low Risk. If we assume there are approximately 15,400 buildings in Bonner County in a rural setting (derived from 2000 Census and Idaho Dept. of Commerce data), then there are about 7200 buildings at high risk. The data also indicates that high-risk situations exist

throughout the county where human habitation exists. There are approximately 1560 homes in the areas identified as high priority by the fire districts. If it is assumed that all of these homes are at high risk, which they may not be, this leaves nearly 5600 homes at high risk throughout the county that are outside the priority areas. This is illustrated in Table 4.

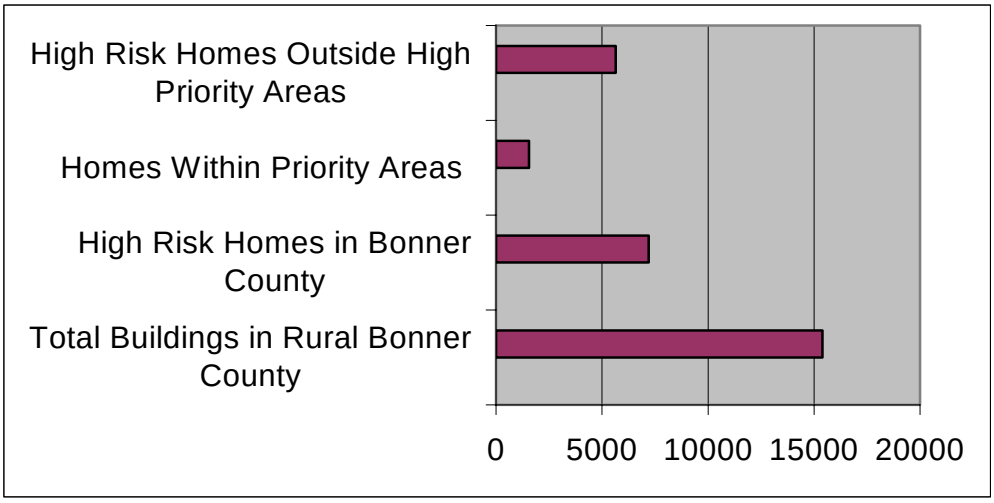

Table 4 Buildings at Risk in Rural Bonner County

PREPAREDNESS ASSESSMENT

The risk assessment would not be complete without an evaluation of existing wildland fire fighting resources, capabilities and overall preparedness. This section of the plan will give the reader an overview of existing planning, fire fighting resources, training, education, and other preparedness issues.

Planning

Bonner County has an Emergency Operations Plan (EOP) that provides standard operating procedures in case of a disaster. The EOP adopts the use of the Incident Command System (ICS) to manage disasters. The ICS is used nation wide by both state and federal agencies in the management of disasters. In the Bonner County EOP a warning system is in place that would alert residents to an impending threat from a wildfire and through it's operational guides provides for evacuation procedures.

Fire District Resources

There are 12 fire districts and three (3) City Fire Departments in Bonner County with varying degrees of capability. The fire districts are primarily structure protection oriented and will fight wild fires when homes are threaten. The majority of the fire fighters in the fire districts are volunteers. Following is a list of equipment, personnel, and facilities for each of the fire districts/departments in Bonner County. The size of each district is also included.